Title: **METAL SPRAY SERVICES SCOPE OF WORK**

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1. PURPOSE

The purpose of this document is to define the services needed from a contractor for provision of a reliable, comprehensive and cost-effective metal spraying service to ERI – TGS, Matla and Rosherville Works.

2. CONTEXT FOR METAL SPRAY

Thermal Spraying (Flame, Arc, HVOF & Plasma) is a process that applies a coating - most often metal alloy, carbide or ceramic that may vary in thickness - onto a substrate through the projection of a molten stream of the chosen material. Virtually any material that can be produced in wire or powder form can be processed into a protective coating. This includes: pure metal and alloy coatings such as, chrome, stainless steel, zinc as well as ceramics and ceramic metal composites such as tungsten carbide or chrome carbide.

Matla Works and Rosherville manufactures and refurbishes small, medium and large size turbine components for Eskom Power stations. Matla nor Rosherville works do not possess the capabilities, skill and facilities of Metal spraying components. Some of these components include gland box casings, Rotor shafts but not limited to where the expertise of metal spraying are required to metal spray the Inside and outside diameters of up to +700mm in diametrical size to a specific depth/thickness as per provided scope of work.

The company should focus on metal spraying services. The service provider should have facilities and equipment that should accommodate components, but not be limited to:

1. Must be able to accommodate diametrical components of Inside and outside diameters up to +700mm.
2. Must be able to accommodate components ranging from a height and length of 150mm to 4m in length.
3. Must be able to spray up to depth/thickness of +2mm of metal onto the component
4. To machine surface finish required for final machined product is N6
5. Due to size of some of the components, the company must have the facilities to execute the scope both in-situ (Eskom Power Stations and Rotek Workshops), and at their own workshop facilities.
6. The company should be able to supply the correct certification required for our demanding clients.
    a. The contractor should be ISO 9001 certified

THERMAL METAL SPRAY APPLICATIONS SHOULD CONFORM TO:

b. EN 657 Thermal spraying - Terminology, classification.
c. EN ISO 14923 Thermal spraying - Characterization and testing of thermally sprayed coatings
d. EN 14616 Thermal spraying - Recommendations for thermal spraying.
e. EN 15311Thermal spraying - Components with thermally sprayed coatings - Technical supply conditions.
f. EN 14665 Thermal spraying - Thermally sprayed coatings - Symbolic representation on drawings.
g. EN ISO 17836 Thermal spraying - Determination of the deposition efficiency for thermal spraying.
h. EN 1395 Thermal spraying - Acceptance inspection of thermal spraying equipment.
i. EN 1395-1Thermal spraying - Acceptance inspection of thermal spraying equipment – Part 1: General requirements.
j. EN 1395-2 Thermal spraying - Acceptance inspection of thermal spraying equipment - Part 2: Flame spraying including HVOF.
k. EN 1395-3 Thermal spraying - Acceptance inspection of thermal spraying equipment - Part 3: Arc spraying.

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l. EN 1395-4Thermal spraying - Acceptance inspection of thermal spraying equipment - Part 4: Plasma spraying.
m. EN 1395-5 Thermal spraying - Acceptance inspection of thermal spraying equipment - Part 5: Plasma spraying in chambers.
n. EN 1395-6 Thermal spraying - Acceptance inspection of thermal spraying equipment - Part 6: Manipulator systems.
o. EN 1395-7 Thermal spraying - Acceptance inspection of thermal spraying equipment - Part 7: Powder feed systems.
p. EN ISO 14922-1 Thermal spraying - Quality requirements of thermally sprayed structures - Part 1: Guidance for selection and use.
q. EN ISO 14922-2 Thermal spraying - Quality requirements of thermally sprayed structures - Part 2: Comprehensive quality requirements.
r. EN 13214 Thermal spraying - Thermal spray coordination - Tasks and responsibilities.
s. EN 15311Thermal spraying – Components with thermally sprayed coatings – Technical supply conditions.
t. EN ISO 14924 Thermal spraying - Post-treatment and finishing of thermally sprayed coatings.
u. EN 15520 Thermal spraying - Recommendations for constructional design of components with thermally sprayed coatings.
v. EN 1274 Thermal spraying - Powders - Composition, technical supply conditions.
w. EN ISO 14919 Thermal spraying - Wires, rods and cords for flame and arc spraying - Classification - Technical supply condition.
x. EN ISO 14918 Thermal spraying - Approval testing of thermal sprayers.
y. ISO/TC 107: Metallic and other inorganic coatings.
z. ASTM C 633-01, Standard Test Method for Adhesion or Cohesion Strength of Thermal Spray Coatings.
aa. ASTM D 4541-02, Test Method for Pull-Off Strength of Coating Using Portable Adhesion Testers.
bb. ANSI/AWS C2.16/C2.16M:2002, Guide for Thermal Spray Operator Qualification.

EXPECTED MATERIAL LIST

CARBON STEELS	ALLOY MATERIALS	OTHER MATERIALS	STAINLESS STEELS
EN8 (080M40)	21CrMoV 5-7 (1.7709); 13CrMo44(1.7335)	INCONEl	S/S 431
EN9 (070M55)	24CrMo5 (1.7258); 40CrMoV4 – 7	CAST IRON	S/S 410
43A MILD STEEL	15/16Mo3 (1.5415)	ALUMINIUM	S/S 420
EN1A BRIGHT	X35CrMo17 (1.4122); X22CrMoV12 – 1 (1.4923)	BRASS	S/S 316
EN19”T” (709M40)	10CrMo 9 – 10 (1.7380)	AL BROZEN	S/S 304
EN24”T” (817M40)	X20Cr13 (1.4021)	PB1 BRONZE	
EN36B	CX12CrMoS17	LPB1 BRONZE	
EN19, EN 24 ANNEALED	X39CrMo17 – 1; DUREHETE 1055		

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3. SCOPE OF WORK

The correct metal spraying procedures, specifications, qualifications and inspections need to be carried out. This will require that all staff performing the tasks to be fully qualified and certified in their specific fields for the purpose of metal spraying steel(s). Nondestructive testing (NDT) of the finished product and all components will also be required. The final sprayed product must be a very low rate distortion, tight dimensions, with good surface finishes and low tolerances.

The machining specifications are as follows, but not limited to

- N6 or 0.8 µm Ra surface finish
- ± 0.01 tolerance

The list below shows the variety of components (but not limited to) that require metal spraying.

- Cylindrical sleeves, shafts, hollow shafts, Spindles
- LP, HP Glandbox casings
- Eccentric Keys
- Volute sleeves
- Valve Seats and modules
- MOP Bearings
- ESV Inserts
- HP Stub Shafts
- Anti-Rotating plates
- BFPT and Main Turbine Glandboxes

NB: All material and components for metal spraying will be supplied by Works engineering, unless otherwise stated.
It is imperative that whenever an item is sent for metal spraying that item will be accompanied with an approved detailed scope of work from Matla and Rosherville Works engineering department. If the contractor for whatever reason is to receive an unapproved scope from Works engineering, the contractor is to ignore such scope and only execute as per approved scope of work. The scope of work will at least include the following points:

1. Detailed drawing(s) that clearly indicates the area or location where spraying should be done
2. Signed off memo detailing the work to be carried out. The scope will also indicate the following:
    a. The amount of metal spray required
    b. The parent material of the component
    c. Inspection of component before spraying (pictures to be taken and any noticeable defects recorded and to be reported immediately)
    d. Dimensional inspection and sizes to be recorded before metal spraying
    e. Inspection(s)required post spraying such as NDT and bond testing
        i. Ensure 100% bonding with component surface.
3. The required surface finish post machining of sprayed area
4. Dimensional inspection of the component as indicated on the scope supplied

The following items need to be sent to Works engineering before spraying commences:

1. Detail Quality control plan (QCP) of the work to be carried out
    a. Approval of the QCP document will give technical go ahead of the scope to be carried out
2. An as received inspection report of the component, immediately upon receipt (pictures indicating any noticeable defects on the components)

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a. A dispatch inspection of each component will be conducted by Eskom Rotek Industries. Note that this inspection report can be compared upon request with the as received inspection conducted by the subcontractor.

NB: An external audit to be conducted by an Eskom Rotek representative will be done before any contract or work is awarded. The audit will determine the capacity and capabilities of the awarded contractor are sufficient to satisfy the requirement discussed above.

REFURBISHMENT AND METAL SPRAYING

Taking the **example** of LP Glandbox casings which are Level 1 components as per Eskom procedure document No. **240-94068830**. The scope will be as follows:

1. Receive components from site
2. Conduct as received inspection and report any defects found
3. Compile a PQP/QCP and send to Matla Works engineer for approval
4. Ensure assembled boxes line up, ensure dimensional stability of gland box
5. Machine to clear of any rust or corroded areas before metal spray is applied
    a. Ensure a smooth clean surface on area to be metal sprayed
6. Metals spray indicated area as indicated on supplied scope of work
7. Perform NDT on component post spraying.
8. Perform dimensional inspection
9. Dispatch to site

4. REPORTING

Reporting shall be on weekly basis. Where immediate action is required by Works engineering personnel the Works engineer and/or technician must be informed immediately. All contact information will be provided.

5. SUPPORTING DOCUMENTS

NB: The following documentation must be returned for the purpose of technical evaluation:

a) As received Inspection report
b) Final inspection report
c) NDT Report
d) Bond test results
e) Material certificate

6. DOCUMENT SUPPORTED BY:

Name	Position	Signature	Date
Phathutshedzo Nemakhavhani	Welding Engineer (Rosherville)		
Joshua Lengwati	Senior Engineer (Rosherville)		
Phillip Litheko	Matla Works Technician		
Sive Madikida	Matla Works Mechanical Manager		

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